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LITTORAL FISH FAUNA NEAR UVIRA, NORTHWESTERN END OF LAKE TANGANYIKA*[1]

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ABSTRACT

The fish fauna near Uvira is composed of 13 families and more than 110 species—38 of non-cichlids and 72 of cichlids. It is considerably different from that in the Ruzizi estuaries and on the Luhanga rocky shores. Stream or estuary species such as Protopterus, Sarogherodon niloticus and cyprinids are abundant in the former, while Synodontis, Mastacembelus and cichlid fishes are in the latter. Some stream or estuary fishes such as Citharinus, Hydrocynus and Tetraodon, which are common in the Maragarasi estuaries, do not seem to inhabit near the Ruzizis. The proportion of endemic species is much higher on the rocky shores than at the muddy area and especially that of cichlids reaches 100%. Sixty-one species of cichlids inhabit the rocky shore of Luhanga in high density and most of them are rock dwellers except Boulengerochromis and Hemibates etc. The proportion of the rock dwellers at Luhanga to the whole rock dwellers of the lake is also high, reaching 70% in cichlids.

INTRODUCTION

The fish fauna in Lake Tanganyika and its tributaries is very rich and contains 20 fish families*[1] and about 240-250 species, more than 60% of which are included in one family, Cichlidae. Endemic species of the fish reach such a high proportion as 56% in the non-cichlids and 98% especially in the cichlids (Poll, 1953, 1956; Brichard, 1978), and these figures seem to indicate that the speciation of the biotic organisms has progressed in the lake during the long period of its isolation.

It is known that the species composition of the littoral fish fauna is considerably different according to the substratum conditions of the habitats, such as muddy, sandy or rocky bottom. Furthermore, the proportion of endemic species is higher on the rocky shore than in other habitats, especially in the cichlids (Poll, 1953, 1956; Brichard, 1978). It has been also pointed out that local races or color variation of the fish are observed in the lake in several cichlid species. These fishes are sedentary and bounded to their habitats, therefore live without any contact with neighboring populations, which are looked upon as gene pools (Marlier, 1959; Brichard, 1978). But there are few papers dealing with the detailed fish fauna of a definite area or habitat, so comparative researches are wanted between different sites or places.

We carried out an ecological survey of fishes in Lake Tanganyika preliminarily from 1977 to 1978 and at first step from 1979 to 1980 near Uvira, northwestern end of the lake, in cooperation with I.R.S. (Institut de Recherche Scientifique)/Uvira, Zaire. H. Kawanabe and K. Takamura of Japan joined us as research staff of the 1977-78 party led by the senior author. And Y. Ankei, M. Hori, H. Kawanabe, Mbomba Nseu Bekeri, K.

Takamura and K. Yamaoka from Japan and Kwetuenda Menga Kuluki of Zaire cooperated with us as the staff of the 1979-80 party led by H. Kawanabe.

In this paper, which deals with the first stage of our surveys, we should like to give a preliminary result of the fish fauna of two different habitats in Uvira district, an estuary and rocky shore.

STUDY AREA AND COLLECTING METHOD

In the north side of the lake near Uvira, River Ruzizi flows into the lake forming a broad delta, and there the shores are sandy except the two river mouths which form muddy estuaries. The western side of the lake is, on the other hand, close to the mountains. Small clear torrents from the mountain ridges, which do not dry up even in dry seasons, flow into the lake, forming small deltas in some places. In consequence, rocky shores alternate with sandy shores along the lake coast. Near Uvira there are fewer rocky shores than sandy ones. The depth is exceptionally shallow in this lake, being about 200 m in the pelagic region.

Fishes were collected at several places near Uvira: Ruzizi, Uvira, Kigongo, Luhanga and so on. In this paper the fish fauna in two different habitats in this region will be described and compared: One at and around the two Ruzizis estuaries locating 15-20 km east of Uvira city, and the other at the rocky shore of Luhanga about 15 km south of the city.

The habitat conditions for fish around the Ruzizis are as follows:

1. Turbid water of the Small and the Large Ruzizi flows in, with floating weeds on their surface, and inlet lagoons and marshes are formed near the river mouths.
2. The shore is mostly sandy and the distance between the two river mouths is about 5 km. The shares near the river mouths are muddy. The lake is shallow for some distance from the shore.
3. Aquatic plants and reeds grow thickly in the inlet lagoons and marshes as well as along the shore near the estuaries.

Habitat conditions of Luhanga shore present a contrast to those

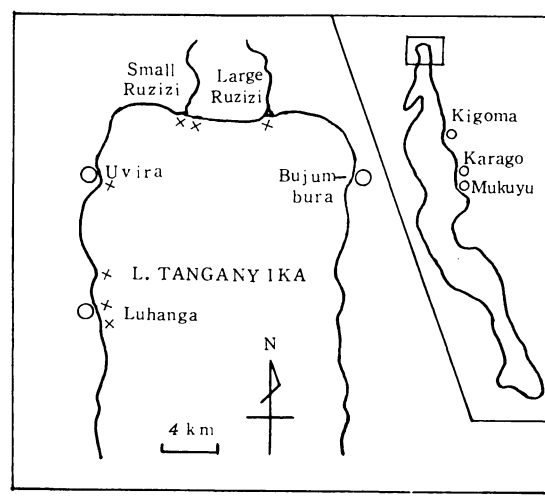

Fig. 1. Sketch map near Uvira. x: indicates collecting sites.

around Ruzizis:
1. There are no inlet streams nor estuaries. Water is clean and transparency is usually more than 10 m.
2. The shore consists mainly of rock with a few sandy patches, and it directly faces open lake.
3. The mountains stand close to the lake, forming cliffs at some places, and the lake becomes deep immediately from the shore, keeping the same angle as shown in Fig. 2.
4. Few aquatic plants and reeds are seen along the shore.
5. The rocky shores extend for more than 2 km and are somewhat isolated by sandy deltas at Kigongo in the north and at Makobola in the south.

Fishes were collected by gill nets, seins as well as casting nets and occasionally by angling or small hand nets, from December 1977 to January 1978 and from October 1979 to February 1980. Native fishermen sometimes helped us by showing their collections.

Collecting sites near the Ruzizis were mostly at the two estuaries and partly on the sandy shore near the Small Ruzizi. At Luganga collecting sites were scattered about 2 km in length along the rocky shore and 0-20 m in depth.

RESULTS AND DISCUSSION

1) Fish Fauna around the Ruzizis

The species composition of the fish collected in the two different habitats near Uvira is shown in Table 1. Twenty-five species of non-cichlid fish and 28 species of cichlids were collected near the Ruzizis. Protopterus, Limnothrissa, Aplocheilichtis and some species of cyprinid fish live only at swamps or in the lake near the river mouths. A smaller number of cichlid species were found near the Ruzizis than at Luhanga. However, some cichlid fishes such as Sarotherodon niloticus, Callochromis spp. and Haplochromis sp. were found at Ruzizis but not at Luhanga.

Marlier (1953) noted 34 fish species including 4 cichlids and 14 cyprinids in the rivers of the Ruzizi basin; among them Micralestes stromosi, Chiloglanis lukugae (Characidae), Barbus lineomaculatus, B. caudovittatus, Agrammobarbus sp. (Cyprinidae) and Mastacembelus taeniatus (Mastacemberidae) were collected near the river mouths. Brichard (1978) also noted two species of Polypterus and several mormyrids in the Ruzizi estuary. We could not collect such species during our surveys, but it is possible more fish species than Table 1 shows actually live near the Ruzizi estuaries. Of course fish species may differ to some extent in each minor habitat: a marsh, a river mouth, a sandy shore, etc.

It is to be noted that some stream or estuary fishes such as Citharinus, Hydrocynus liniatus and Tetraodon, which are common at the Maragarasi estuaries near Karago (Kawabata and Doi, 1972) and River Lukuga, do not seem to live near the Ruzizis.

2) Fish Fauna on the Rocky Shores of Luhanga

The fish fauna at Luhanga contains 87 fish species, comprising 26 species of non-cichlid fishes and 61 cichlids. Synodontis and Mastacembelus were rather abundant in species number. The most characteristic feature of the fish fauna here in comparison with that of the Ruzizis is a great abundance of cichlid species with fewer cyprinids and a much higher proportion of endemic fishes. It reaches about 88% in non-cichlids and 100% in cichlids at Luhanga, while about 80% and 93% respectively at the Ruzizis.

As mentioned in the introduction, few researches have so far been

made on the species composition of the fish fauna in a comparatively limited area of rocky shores. Fifty species including 25 non-cichlids and 25 cichlids were collected near Mukuyu on the east coast of the lake (Kawabata, 1975; Kawabata and Doi, 1972). It seems that cyprinids and characins are rather abundant at Mukuyu than at Luhanga, probably owing to some sandy shores with a few aquatic plants and reeds. A much smaller number of cichlid species were collected at Mukuyu than at Luhanga, but this result is rather unreliable for comparison because the fish were collected mostly by using larger mesh gill nets at Mukuyu.

It is noteworthy that 87 species are found on the rocky shore of Luhanga which ranges only about 2 km in length, and the greatest depth where we could collect them was about 20 m. This means the rocky shore has such a rich fauna in the rather small area. Concerning the 61 species of the cichlids in this area, most of them are rock dwellers except a few fishes such as Boulengerochromis, Bathybates, Sarotherodon, etc. Diving observation showed that they live also in high density, 20 fishes/m^2 of all species and Lamprologus brichardi is the most abundant (Hori, Yamaoka and Takamura, personal communication). On the fishes of the rocky shore Beadle (1974) noted about 40 endemic chchlids in this lake and also Fryer (1959) recorded 27 cichlid species and 5 of other families with 6-7 fishes per square meter in Lake Malawi. The above figures show that the rocky shore of Luhanga has a much greater number of species in fish fauna with a much higher density than any other areas in which previous observations were made.

Few researches, from the ecological point of view, deal with the fish fauna in a limited small habitat especially of rocky shore which is indispensable to the speciation problem in the lake. It has already been pointed out that each cichlid shows a great variety of life form and of feeding habits. They coexist and fill very similar niches on rocky shores, which have a high variety of habitat conditions for many kinds of aquatic animals (Beadle, 1974; Brichard, 1978; Fryer and Iles, 1972). Meanwhile, it is also known that each rocky shore isolates its population in some cichlid species (Marlier, 1959; Beadle, 1974).

We should like to consider from another aspect, that is, the habitat preference or the sedentarity of the fish nature to some limited habitats. After the inventory of fishes in Brichard's book (1978), species numbers of non-cichlids and cichlids inhabiting rocky bottoms over the lake are 24 and 60 respectively, while those living in the whole estuaries, swamps or mud and sand bottom habitats 28 and 50 each. On the habitat preference or sedentarity of these fishes, according to his book, it may be said that the Luhangas have 9 species (38%) of the rock dwelling non-cichlids and 42 (70%) of the cichlids; on the other hand, the Ruzizis has 10 (36%) of the mud dwelling non-cichlids and 12 (24%) of the cichlids. Considering that the area of our study is too small in comparison with whole habitats of the lake, it is a rather surprising fact that a high percentage of fish species actually live together in such a limited area, especially in the case of rock dwelling cichlids at Luhanga. For further consideration on the speciation of fishes in Lake Tanganyika, we need much more information on local faunas of various districts as well as more precise data on the ecology of each fish.

SUMMARY

1. Species composition of the littoral fish fauna near Uvira was investigated during December 1977 to January 1978 and October 1979 to February 1980, mainly in two different habitats.
2. The Ruzizi estuaries contain 53 fish species: 25 of non-cichlid fishes

and 28 of cichlids, while the Luhanga rocky shore was inhabited by 87 species: 26 and 61 respectively.
3. Protopterus, Sarotherodon niloticus and cyprinids are abundant in the former, while Synodontis, Mastacembelus and especially cichlids are much abundant in the latter.
4. The rocky shore of Luhanga is inhabited with such a high density as 20 fishes per square meter of all species and the proportion of endemic species in cichlids reaches 100%.
5. The proportion of rock dwellers in Luhanga to the whole rock dwellers and that of mud-sand dwellers in Ruzizi to the whole ones of the lake are examined, and again itis high in cichlids of rocky shore, reaching 70%.

ACKNOWLEDGEMENTS

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NOTES

*1 Supported by Grant-in-Aid for Overseas Scientific Survey in 1977 and 1979 (No. 404130) of the Ministry of Education, Science and Culture, Japan.
*2 Schilbe mystus was collected in the estuaries of River Maragarasi near Karago in February 1966 by Kawabata; the family Schilbeidae is, therefore, to be added.

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Table 1. Fishes collected near Uvira (by M. Kawabata, Mihigo N.Y.K., K. Takamura and K. Yamaoka[1])

	Scientific name	Localities: Ruzizi	Localities: Luhanga	Vernacular name
	A) Non-Cichlidae			
	Lepidosirenidae			
	Protopterus aethiopicus Haeckel	+		Mjombo
	Clupeidae			
E[2]	*Limnothrissa miodon* (Boulenger)	+	(+)[3]	Lumbu, Ndagala
E	*Stolothrissa tanganicae* Regan	(+)	(+)	Kalumba, Ndagala
	Mormyridae			
	Hippopotamyrus discorhynchus (Peters)		+	
	Characidae			
	Alestes imberi Peters	+		
	A. rhodopleura Boulenger		+	
	Cyprinidae			
	Barbus serrifer Boulenger	+		Katendere
E	*B. tropidolepis* Boulenger	+		Jembe
	B. sp. 1	+		Katendere
	B. sp. 2	+		Katendere
	Barilius moorii Boulenger	+	+	Sardine, Mkenia, Kirangara
	Labeo cylindricus Peters	+		Ningu
E	*Varicorhinus tanganicae* Boulenger	+	+	Mbalaga, Jembe
	Bagridae			
	Bagrus docmac (Forskal)	+		Kibonde
E	*Chrysichthys brachynema* Boulenger	+	+	Kibonde, Kifyunu
E	*C. grandis* Boulenger		+	Kibonde
E	*C. graueri* Steindachner		+	Kibonde
E	*C. platycephalus* Worthington et Ricardo		+	Kibonde
E	*C. stappersii* Boulenger	+		Sanana
E	*C.* sp.		+	
	Auchenoglanis occidentalis (Valennciennes)	+	+	Kafieke
	Mochokidae			
E	*Synodontis dhonti* Boulenger		+	Kangongo
E	*S. eurystomus* Matthes		+	Kangongo
E	*S. multipunctatus* Boulenger	+	+	Kangongo
	Clariidae			
	Clarias mossambicus Peters	+		Kabambale, Kambale
E	*Dinotopterus cunningtoni* Boulenger	+	+	Singa
E	*Tanganikallabes martiauxi* Poll		+	Kabambale
	Malapteruridae			
	Malapterurus electricus (Gmelin)	+	+	Nika
	Cyprinodontidae			
	Aplocheilichtys pumilus (Boulenger)	+		
E	*Lamprichthys tanganicanus* (Boulenger)		+	Lushiha, Karusiya
	Centropomidae			
E	*Lates anguistifrons* Boulenger	(+)	+	Capitaine
E	*L. mariae* Steindachner	+	+	Sangara
E	*L. microlepis* Boulenger	+	+	Nonzi
E	*Luciolates stappersii* Boulenger	(+)	(+)	Mukeke
	Mastacembelidae			
E	*Mastacembelus albomaculatus* Poll		+	Mlombo
E	*M. frenatus* Boulenger		+	Mugwamo
E	*M. moorii* Boulenger		+	Mlombo
E	*M. ophidium* Günther	+		Mlombo
	Subtotal 12 families 38 spp.	25 spp.	26 spp.	

continued

	Scientific name	Ruzizi	Luhanga	Vernacular name
B) Cichlidae				
E	*Asprotilapia leptura* Boulenger		+	Mulonda, Kayenga
E	*Aulonocranus dewindti* (Boulenger)	+	+	Kikula, Kijanga
E	*Bathybates fasciatus* Boulenger	+	+	Mubangabanga
E	*B. graueri* Steindachner	+		Mubangabanga
E	*B. minor* Boulenger	+		Mubangabanga
E	*B. vittatus* Boulenger		+	Mubangabanga
E	*Boulengerochromis microlepis* (Boulenger)	+	+	Kuhe
E	*Callochromis macrops melanostigma* (Boulenger)	+		Kiririma
E	*C. pleurospilus* (Boulenger)	+		Kasaro
E	*Cardiopharynx* sp.	+		Kararamba
E	*Cyathopharynx furcifer* (Boulenger)		+	Lala
E	*Cyphotilapia frontosa* (Boulenger)		+	Ngumukumu
E	*Eretmodus cyanostictus* Boulenger		+	Shisha
E	*Grammatotria lemairei* Boulenger	+	+	Nungi
	Haplochromis sp. (*burtoni* Günther?)	+		Kijole
E	*H. benthicola* Matthes		+	
E	*H. horei* (Günther)	+	+	Kijole, Ndomo
E	*H. pfefferi* (Boulenger)	+	+	Kijole, Ndomo
E	*Haplotaxodon microlepis* Boulenger		+	Narugogo
E	*Hemibates stenosoma* (Boulenger)	+	+	Kiroroge, Mubangabanga
E	*Julidochromis marlieri* Poll		+	Pongo
E	*J. transcriptus* Matthes		+	
E	*Lamprologus attenuatus* Steindachner		+	Mundulwa
E	*L. brichardi* Poll		+	Mkumbi
E	*L. callipterus* Boulenger	+	+	Mundulwa, Pongo
E	*L. compressiceps* Boulenger	+	+	Kabego
E	*L. cunningtoni* Boulenger	+		Mundulwa
E	*L. elongatus* Boulenger	+	+	Mundulwa
E	*L. fasciatus* Boulenger		+	Mundulwa
E	*L. furcifer* Boulenger		+	Kabego
E	*L. leleupi* Poll		+	Pongo
E	*L. lemairei* Boulenger		+	Mundulwa, Kikaragata
E	*L. modestus* (Boulenger)		+	Mundulwa, Mukumbi
E	*L. pleuromaculatus* Trewavas et Poll	+	+	Mundulwa
E	*L. profundicola* Poll		+	Mundulwa, Kikula
E	*L.savorgi* Poll		+	Mundulwa
E	*L. tretocephalus* Boulenger		+	Ndubu
E	*L. toae* Poll		+	
E	*L.* sp. 1		+	
E	*L.* sp. 2		+	
E	*Lestradea perspicax perspicax* Poll		+	Kararamba
E	*Limnochromis microlepidotus* Poll		+	
E	*L. nigripinnis* (Boulenger)		+	
E	*Limnotilapia dardennei* (Boulenger)	+	+	Kungura
E	*Lobochilotes labiatus* Boulenger		+	Ndava
E	*Ophthalmochromis nasutus* Poll et Matthes		+	Lala
E	*O. ventralis heterodontus* Poll et Matthes		+	Lala
E	*Perissodus microlepis* Boulenger		+	Kiatamagamba, Mbeta
E	*Petrochromis famula* Mattes et Trewavas		+	Kokola
E	*P. fasciolatus* Boulenger		+	Kokola

continued

	Scientific name	Ruzizi	Luhanga	Vernacular name
E	*P.orthognathus* Matthes		+	Kokola, Nbeka
E	*P.polyodon* Boulenger		+	Kokola, Kikula
E	*P.trewavasae* Poll		+	Kokola, Mbeka
E	*plecodus paradoxus* Boulenger	+	+	Mbeta
E	*P.straeleni* Poll		+	Mbeta
	Sarotherodon niloticus(Linné)	+		Makoke, Ngege
E	*S. tanganicae* (Günther)	+	+	Mgege
E	*Simochromis babaulti* Pellegrin		+	Kikula
E	*S. curvifrons* Poll		+	Kikula
E	*S. diagramma* Günther	+	+	Kikula
E	*S. marginatus* Poll		+	Kikula
E	*Spathodus marlieri* Poll		+	Sisha
E	*Tanganicodus irsacae* Poll		+	Sisha
E	*Telmatochromis bifrenatus* Myers		+	
E	*T. caninus* Poll	+	+	Sisha, Kanyamilombo
E	*T. temporalis* Boulenger		+	Sisha, Kanyamilombo
E	*Trematocara stigmaticum* Poll	+		Kanduvya
E	*Tropheus moorii* Boulenger		+	Mbeka
E	*Tylochromis polylepis* (Boulenger)	+		Ndanga
E	*Xenotilapia boulengeri* (Poll)		+	Mulonda, Kalonda
E	*X. melanogenys* (Boulenger)	+		Mulonda
E	*X. ochrogenys* Boulenger	+	+	Mulonda
Subtotal	32 genera 72 spp.[4]	28 spp.	61 spp.	
Total	13 families 110 spp.	53 spp.	87 spp.	

1) The species were identified according to Poll (1953, 1956) and Brichard (1978), especially Cichlidae by Takamura and Yamaoka. All specimens are conserved in the Laboratory of Animal Ecology, Kyoto University, and the Biological Laboratory, Shizuoka Women's University. 2) E indicates endemic species. 3) ( ) shows fishes collected by fishermen. 4) Though we collected other 3 species, *Xenotilapia* sp. at Kigongo about 1 km north of Luhanga, and *Xenotilapia sima* and *Tropheus duboisi* at Pemba about 10 km south of Luhanga, they were eliminated in this list.

Fig. 2. View of Luhanga.

Fig. 4. Fishes collected by seine net at sandy shore near the Small Ruzizi.

Fig. 3. The Small Ruzizi estuaries and native fish net.

Fig. 5. Nonzi, Lates microlepis Boulenger, Latidae.

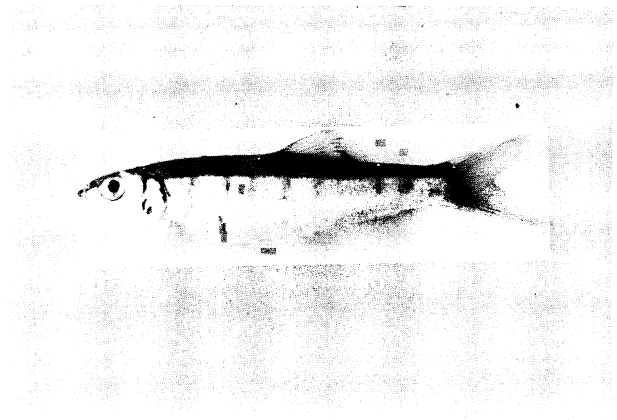

Fig. 6. Sardine, Barillius moorii Boulenger Cyprinidae.

Fig. 7. Kafieke, Auchenoglanis occidentalis Valennciennes, Bagridae.

Fig. 8. Kuhe, Boulengerochromis microlepis (Boulenger), Cichlidae.

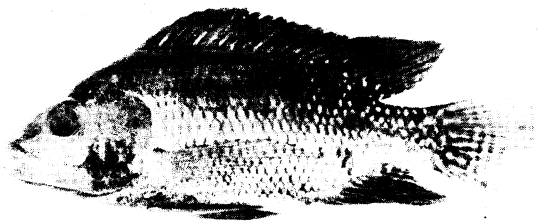

Fig. 9. Ngege, Sarotherodon niloticus (Linné) Cichlidae.

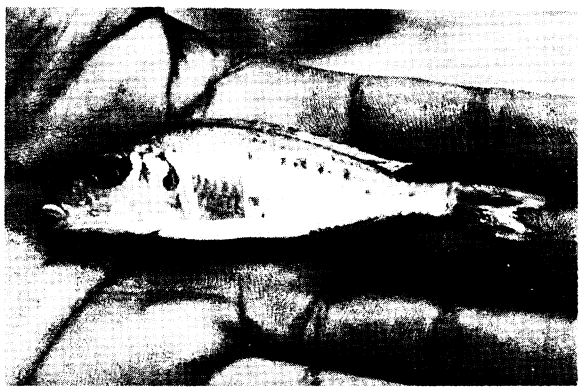

Fig. 10. Kasaro, Callochromis pleurospilus (Boulenger), Cichlidae.

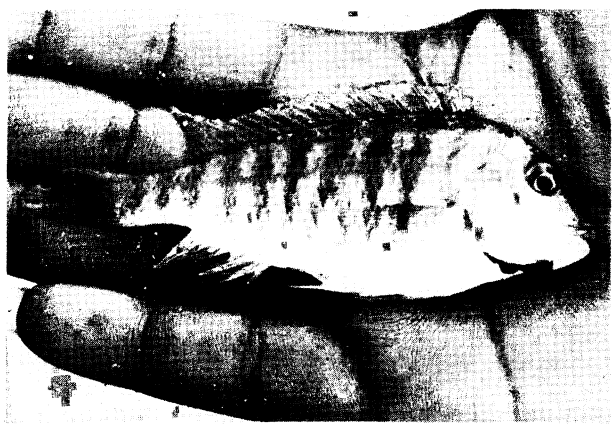

Fig. 11. Kikula, Simochromis diagramma (Günther), Cichlidae.

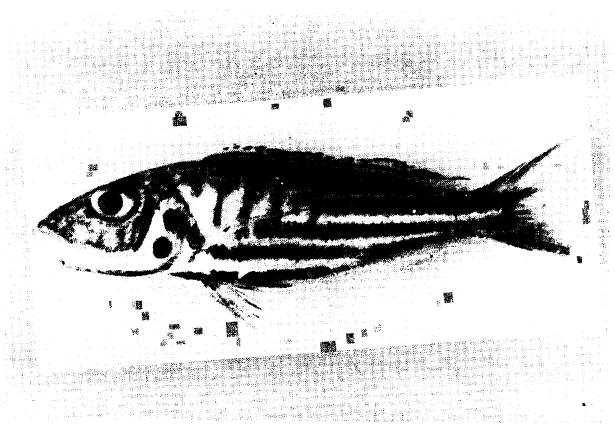

Fig. 12. Mbangabanga, Bathybates graueri Steindachner, Cichlidae.